

# Climate Change, Extreme Temperature Events and Chronic Diseases

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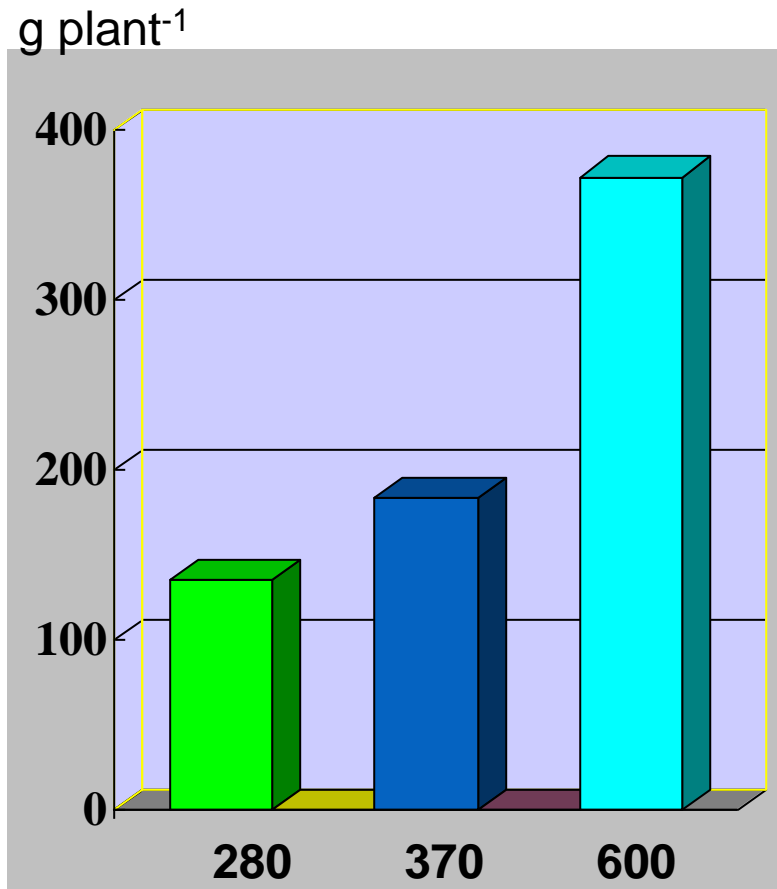
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# Response of common ragweed to CO<sub>2</sub>



- Pollen Production**

280 ppm	4.8 g
370 ppm	10.9 g*
600 ppm	20.5 g*

**Antigen Amb a1 ELISA / mg protein**

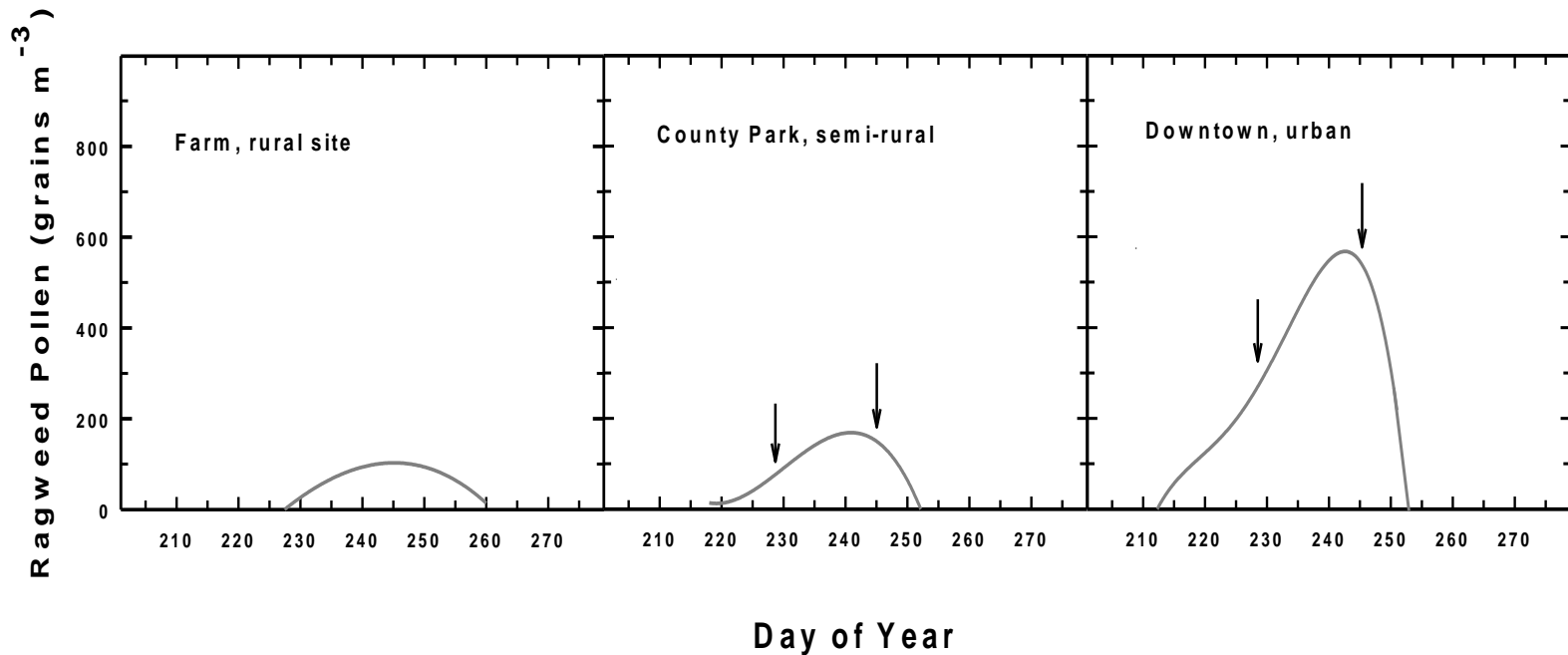
280 ppm	4490
370 ppm	5290
600 ppm	8180*

Chamber Study, USDA

*Functional Plant Biology* 27:893-898

*Functional Plant Biology* 32:667-670

# Ragweed pollen season and concentration: Results from a natural experiment



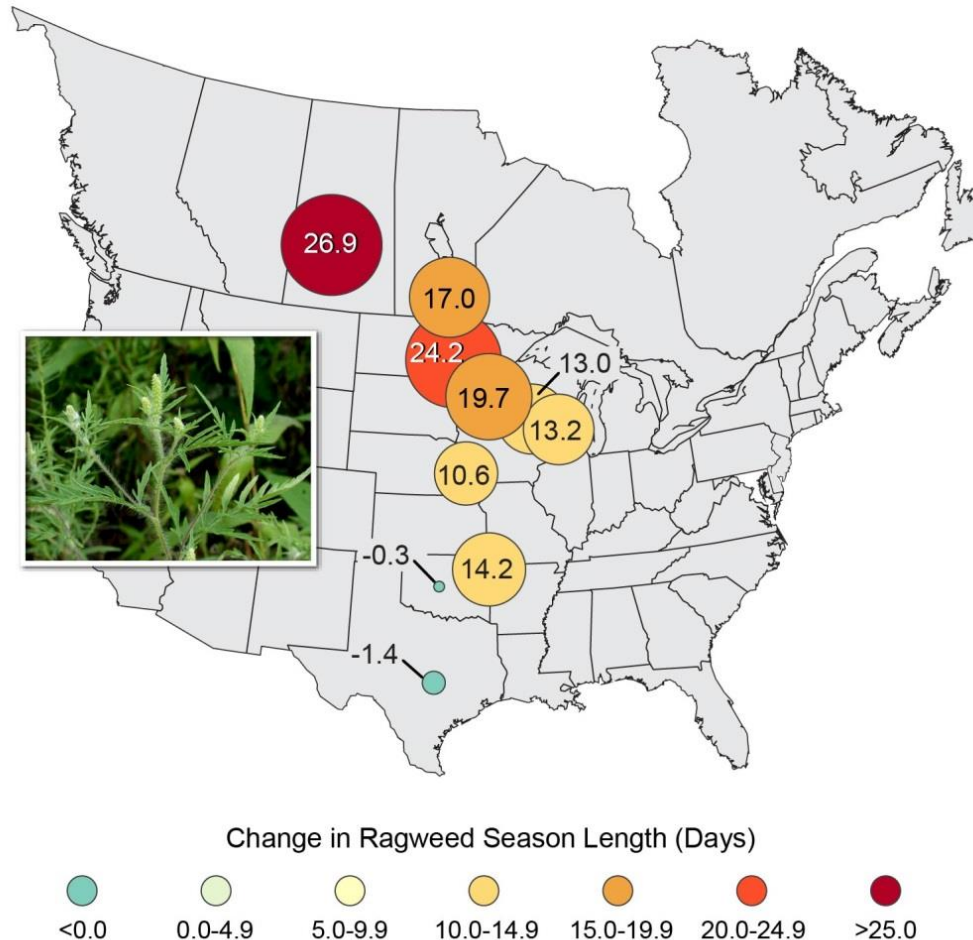
## Urban areas:

- Longer growing season, and higher pollen concentration
- Warmer temperatures, and more carbon dioxide.

Credit: Dr. Ziska, USDA

# Lengthening of Ragweed Pollen Season 1995:2011

Ragweed Pollen Season Lengthens



Credit: Dr. Ziska, USDA (Ziska et al. 2011)

# Link to Chronic Diseases

- Hay fever
  - prevalence 7.5% in 2012
  - Annual cost ~ \$11.2 billion in medical expenses
  - impacts quality of life
- Asthma
  - Approximately 26 million Americans suffer from asthma (8 % of US Children and 7% of Adults)
  - Annual cost \$56 billion

# Data Sources

- Health outcome data
  - Allergic rhinitis:
    - CDC's National Interview Survey (1997-2013)
    - N = 505,386 adults 42,601(8.43%) with allergic rhinitis
  - Asthma:
    - Maryland Department of Health and Mental Hygiene (2002-2012)
    - N = 116,470 ER visits for asthma
- Extreme temperature events defined as:
  - days with Tmax exceed the 95<sup>th</sup> percentile of county and calendar month specific daily Tmax values for 1960-1989.

# Extreme Temperature Events and Prevalence of Hay Fever in the US

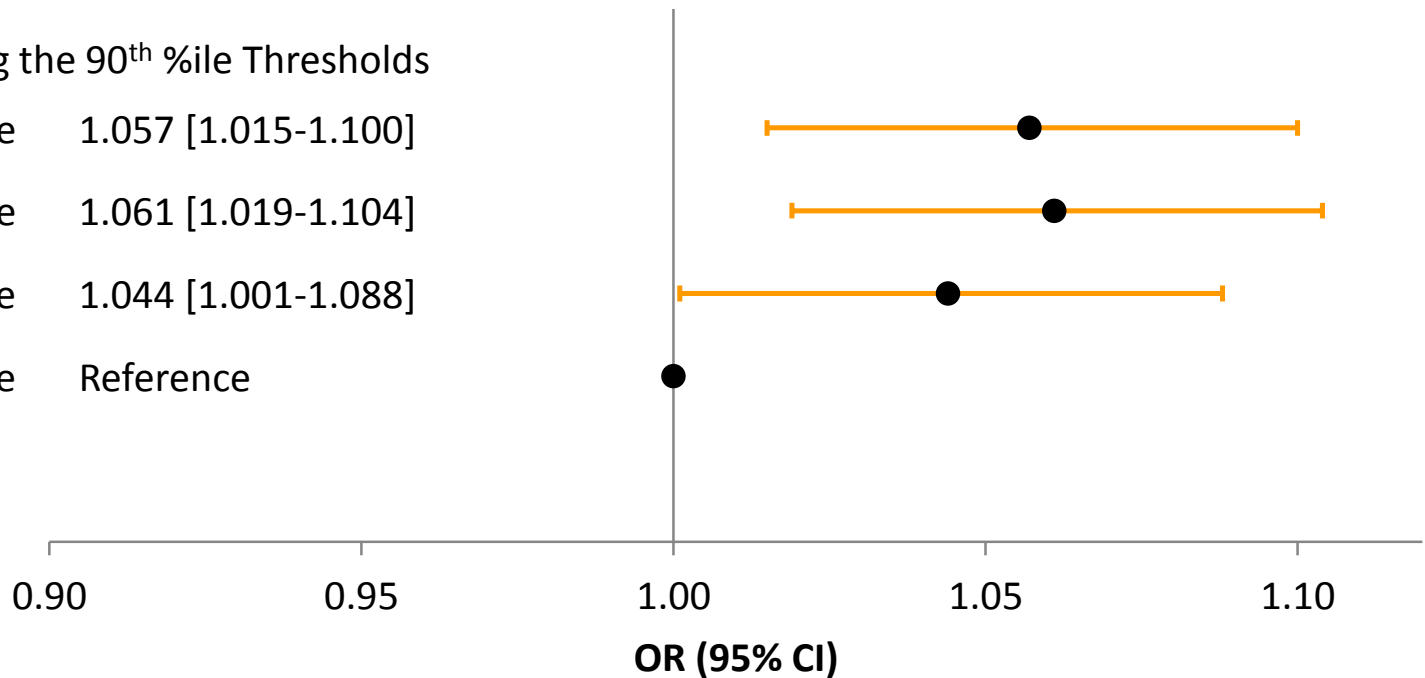
# of Days exceeding the 90<sup>th</sup> %ile Thresholds

4<sup>th</sup> Quartile 1.057 [1.015-1.100]

3<sup>rd</sup> Quartile 1.061 [1.019-1.104]

2<sup>nd</sup> Quartile 1.044 [1.001-1.088]

1<sup>st</sup> Quartile Reference



Adjusted for age, gender, race/ethnicity, education, poverty status

Preliminary results

# Hay Fever by Race: Northeastern US

## Northeast

### Non-Hispanic White

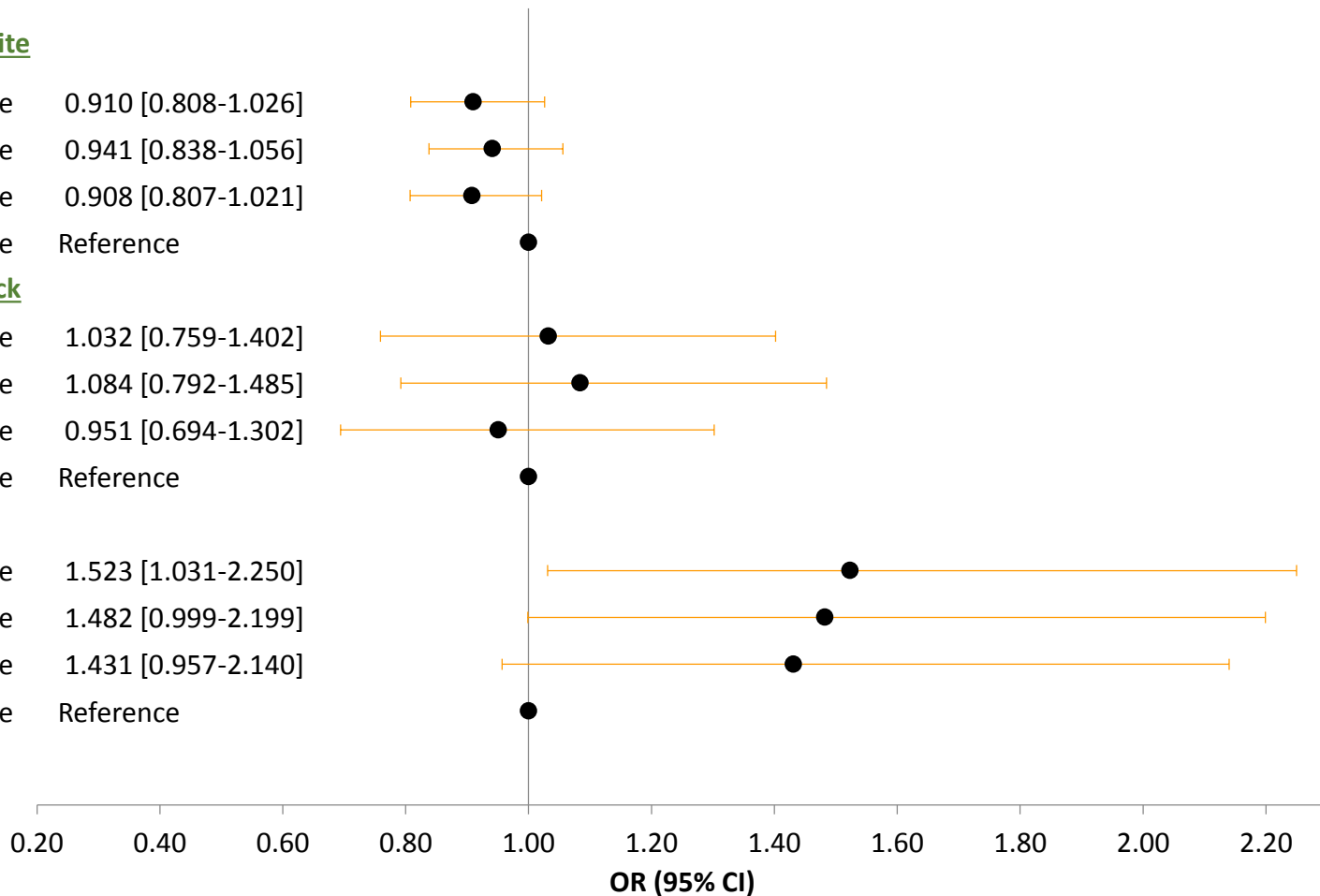
4 <sup>th</sup> Quartile	0.910 [0.808-1.026]
3 <sup>rd</sup> Quartile	0.941 [0.838-1.056]
2 <sup>nd</sup> Quartile	0.908 [0.807-1.021]
1 <sup>st</sup> Quartile	Reference

### Non-Hispanic Black

4 <sup>th</sup> Quartile	1.032 [0.759-1.402]
3 <sup>rd</sup> Quartile	1.084 [0.792-1.485]
2 <sup>nd</sup> Quartile	0.951 [0.694-1.302]
1 <sup>st</sup> Quartile	Reference

### Hispanic

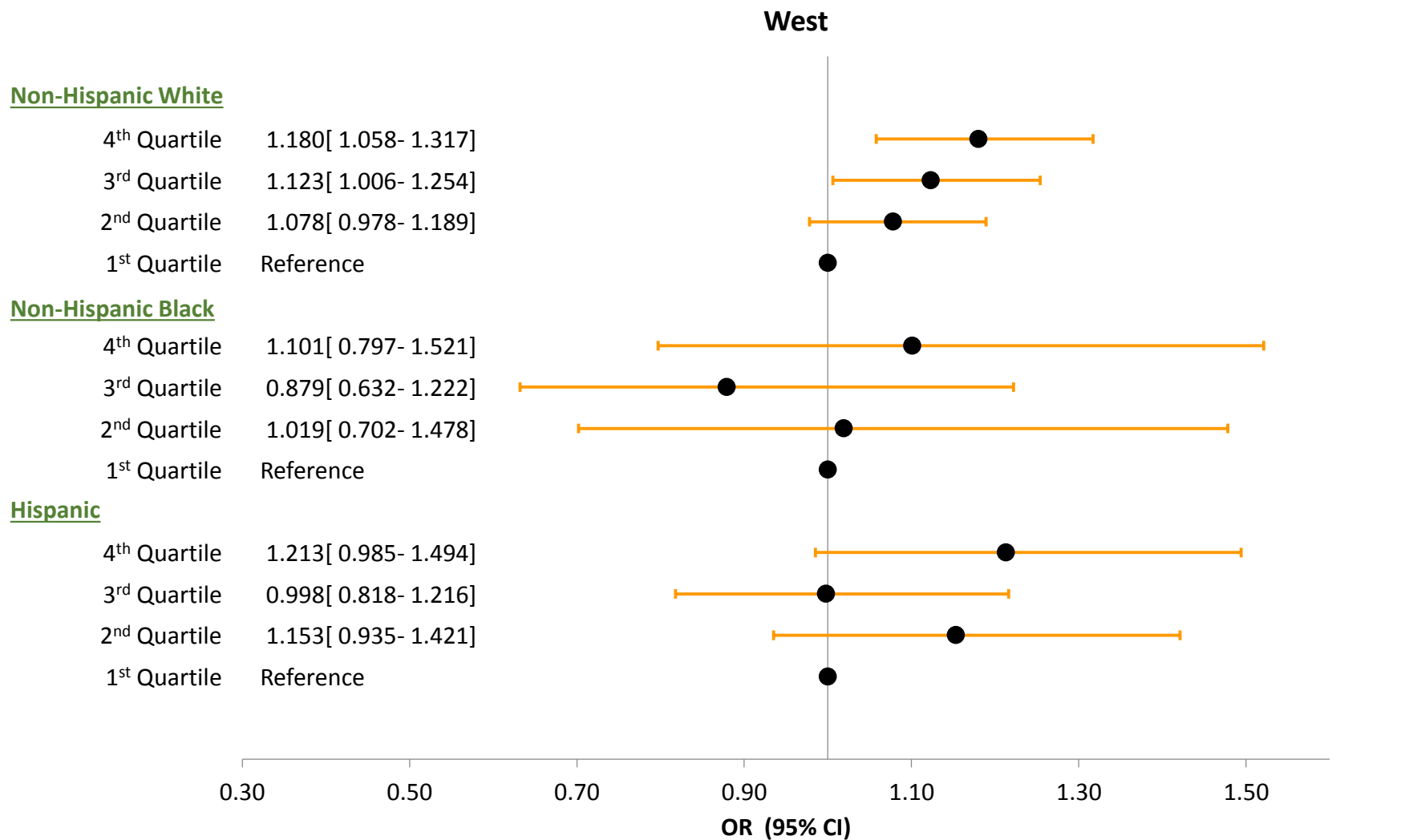
4 <sup>th</sup> Quartile	1.523 [1.031-2.250]
3 <sup>rd</sup> Quartile	1.482 [0.999-2.199]
2 <sup>nd</sup> Quartile	1.431 [0.957-2.140]
1 <sup>st</sup> Quartile	Reference



Adjusted for: age, gender, race/ethnicity, education, poverty status

Preliminary results

# Hay Fever by Race: Western US



Adjusted for: age, gender, race/ethnicity, education, poverty status

Preliminary results

# Seasonal Extreme Temperature Events and Hay Fever Prevalence in the US

## Seasonal Cumulative Sum

### Fall

4 <sup>th</sup> Quartile	1.050 [ 1.009- 1.093]
3 <sup>rd</sup> Quartile	1.015 [ 0.981- 1.051]
2 <sup>nd</sup> Quartile	1.057 [ 1.018- 1.098]
1 <sup>st</sup> Quartile	Reference

### Summer

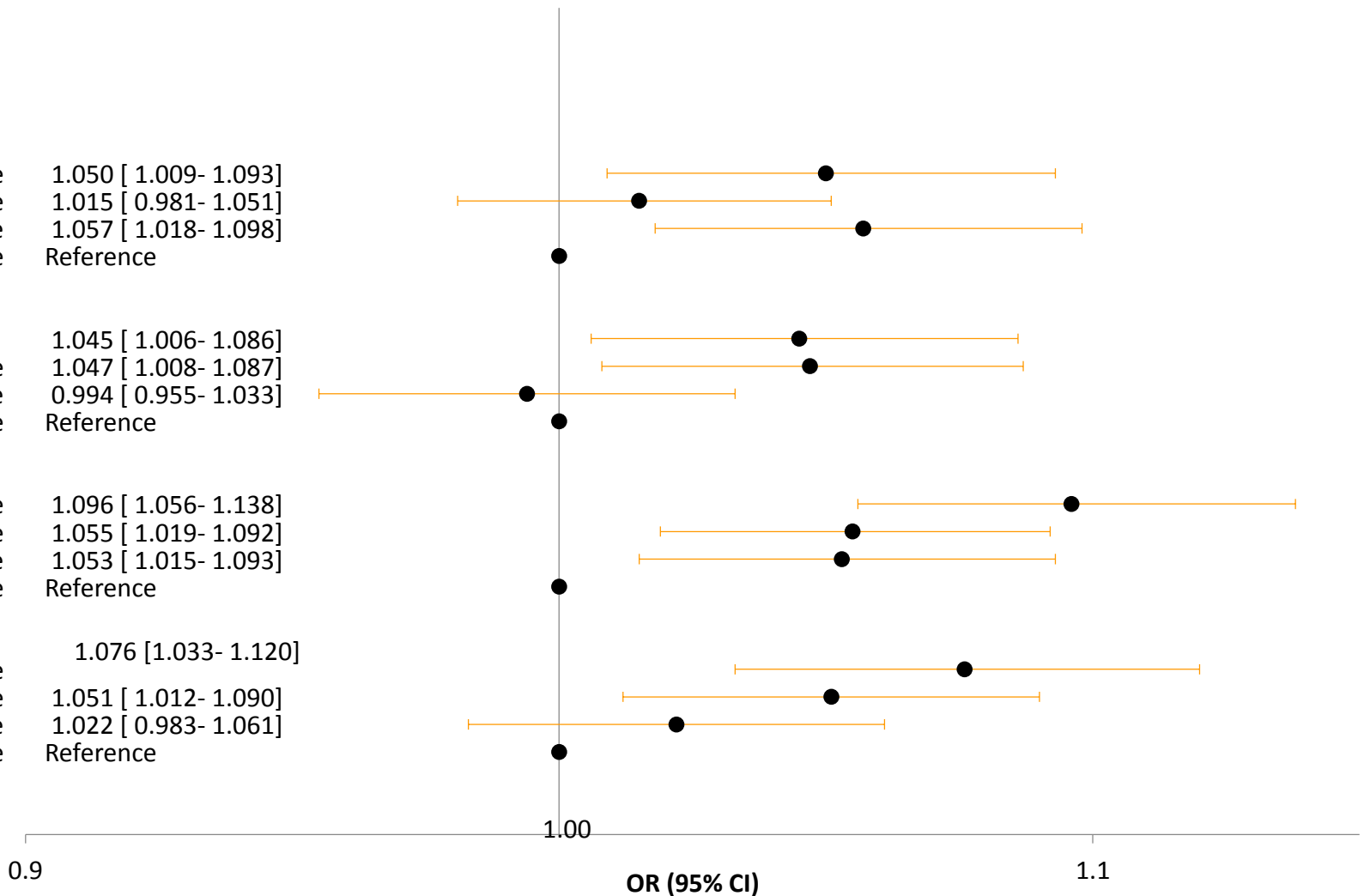
4 <sup>th</sup> Quartile	1.045 [ 1.006- 1.086]
3 <sup>rd</sup> Quartile	1.047 [ 1.008- 1.087]
2 <sup>nd</sup> Quartile	0.994 [ 0.955- 1.033]
1 <sup>st</sup> Quartile	Reference

### Spring

4 <sup>th</sup> Quartile	1.096 [ 1.056- 1.138]
3 <sup>rd</sup> Quartile	1.055 [ 1.019- 1.092]
2 <sup>nd</sup> Quartile	1.053 [ 1.015- 1.093]
1 <sup>st</sup> Quartile	Reference

### Winter

4 <sup>th</sup> Quartile	1.076 [ 1.033- 1.120]
3 <sup>rd</sup> Quartile	1.051 [ 1.012- 1.090]
2 <sup>nd</sup> Quartile	1.022 [ 0.983- 1.061]
1 <sup>st</sup> Quartile	Reference



Adjusted for: age, gender, race/ethnicity, education, poverty status, region, urban/rural classification

Preliminary results

# Extreme Temperature and ER visits for Asthma in Maryland

Location	Year Round Odds Ratio 95% CI)	Summer Only Odds Ratio 95% CI)
Maryland	1.03 (1.00, 1.07)	1.22 (1.14, 1.32)
Baltimore City	1.10 (1.02, 1.19)	1.37 (1.14, 1.65)
Prince George's County	1.02 (0.93, 1.11)	1.19 (1.00, 1.41)
Wicomico County	0.92 (0.73, 1.15)	1.23 (0.77, 1.95)
Washington County	1.23 (0.97, 1.55)	1.76 (1.09, 2.85)

Preliminary results

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Deviation (Start of Season and Extreme Temp Events)

